IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF OKLAHOMA

STATE OF OKLAHOMA, ex rel, W. A. DREW EDMONDSON, in his capacity as ATTORNEY GENERAL OF THE STATE OF OKLAHOMA, and OKLAHOMA SECRETARY OF THE ENVIRONMENT C. MILES TOLBERT, in his capacity as the TRUSTEE FOR NATURAL RESOURCES FOR THE STATE OF OKLAHOMA, Plaintiff, V. TYSON FOODS, TYSON POULTRY, INC., TYSON CHICKEN, INC., COBB-VANTRESS, INC., AVIAGEN, INC.,CAL-MAINE FOODS, INC., CAL-MAINE FARMS, INC., CARGILL, INC., CARGILL TURKEY PRODUCTS, LLC, GEORGE'S, INC., GEORGE'S FARMS, INC., PETERSON FARMS, INC., SIMMONS FOODS, INC. AND WILLOWBROOK FOODS, INC. Defendants.	§ §	CASE NO. 05-CV-329-GFK-SAJ

AFFIDAVIT OF J. BERTON FISHER, Ph.D

The undersigned, J. Berton Fisher, does solemnly swear and state:

1. I am a geochemist and geologist with expertise in the transport and fate of materials in the environment. I hold a Ph.D. and M.S. in Earth Sciences from

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Case Western Reserve University and a B.S. in Geology and Geophysics from Yale University. I am a Certified Professional Geologist, a Registered Professional Geoscientist in the State of Texas and a Registered Professional Geologist in the State of Mississippi. I have published scientific papers regarding technical environmental matters in peer-reviewed publications, and I have given numerous technical presentations regarding environmental matters at scientific meetings. I have worked on the engineering and scientific aspects of numerous environmental litigation, regulatory and transaction matters, including, specifically, environmental matters related to the land disposal of poultry wastes. I have worked professionally as a geochemist and geologist since 1973 and have worked on matters related to agricultural, industrial, petroleum and mining environmental contamination for nearly twenty-five years. My work experience includes consulting, industrial and academic positions. My experience in technical environmental matters includes site investigations, review of site investigation data, analysis of the chemical and physical characteristics of environmental samples, historic research on industrial and agricultural activities and processes, petroleum exploration and production, and mining, the environmental chemistry of organic and inorganic contaminants and studies of the fate and transport of organic and inorganic contaminants in soils, sediments and water, including the collection of undisturbed cores of unconsolidated lake sediment and the geochronological analysis of undisturbed cores of unconsolidated lake sediments using natural and anthropogenic radioactive nuclides and paleontological markers.

Since 1997 I have worked on matters related to the environmental contamination by poultry wastes including the chemistry, generation and land disposal of poultry wastes, the identification of poultry waste constituents in the environment, their fate and transport in the environment, the effects of poultry waste contaminants on water quality, and the management of poultry waste land disposal in eastern Oklahoma and western Arkansas. I have served as a consultant to the Tulsa Metropolitan Utility Authority and the City of Tulsa with respect to poultry waste issues from 1997 to the present.

2. I have been retained by the Oklahoma Attorney General to provide analysis and advice on the fate and transport of land applied poultry waste and to evaluate poultry waste generation and disposal practices.

3. Based on the Census of Agriculture compiled and published by the United States Department of Agriculture, National Agricultural Statistics Service for 2002, Benton County, Arkansas and Washington County, Arkansas (the two counties in Arkansas that overwhelmingly comprise the Arkansas portion of the Illinois River Watershed (IRW)) are listed as having the 3rd (128,066,609 birds) and 4th (109,890,530 birds) largest sales of broilers and other meat type chickens of all 3,078 counties in the United States.

4. Based on published scientific literature and my review of analyses of samples collected of Defendants' waste, the constituents of environmental concern in poultry waste include numerous identifiable constituents including phosphorous, metals and pathogens (i.e. bacteria).

5. Based on published literature, reports made by investigators retained by the Oklahoma Attorney General, records maintained by the Oklahoma Department of Agriculture Food and Forestry, and my direct observation, a significant amount of poultry wastes have been land applied within the IRW by each of the Defendants (Cal Maine, Cargill, Cobb-Vantress, Georges, Peterson Farms, Simmons Foods, Tyson Foods and Willow Brook Foods) employing simple surface application using broadcast spreading equipment.

6. Due to the conditions of terrain, soils and geology existing within the IRW, bacteria, as well as the other constituents of poultry waste that is land applied within the IRW have a propensity to run off the fields on which it is spread to nearby surface water in creeks or streams or infiltrate through the soils and underlying regolith and bedrock and travel to the ground water. Thereafter, these surface and ground waters carrying the waste constituents transport them to larger streams and rivers and ultimately move them to Lake Tenkiller.

7. Based on my review of published scientific literature, aerial photographs, and my personal observations, the following soil and geological conditions within

the IRW demonstrate this propensity of the constituents of land applied poultry waste to readily travel from the fields where land application has occurred to surface and ground water of the IRW:

(a) Surface water movement within the IRW is controlled by its underlying geology. The major streams in the IRW (Illinois River, Flint Creek, Baron Fork and Caney Creek) have developed within geological faults and fractures. These streams flow westerly and southwesterly, and become, in general, progressively more deeply incised as they pass from the Arkansas portion of the IRW to the Oklahoma portion of the IRW. The Arkansas portion of the IRW is dominated by broad open grassed areas of low topographic relief that are dissected by numerous tributary drainages. In the Oklahoma portion of the IRW, topographic relief is greater, and the major streams form broader more steeply-sided forested valleys that separate more isolated grassed areas. Simply stated, the Arkansas portion of the IRW is flatter and more open. This condition facilitates the disposal of poultry wastes through land application. In contrast, the Oklahoma portion of the IRW is generally hillier and thus is less topographically suitable for the disposal of poultry wastes through land application.

(b) The faults and fractures that control drainage within the IRW are primarily associated with the Ozark uplift. The Ozark uplift postdates the deposition of the youngest bedrock (Mississippian) within the IRW. As a result, this uplift disturbed all strata within the IRW. Consequently, significant fracturing and faulting observed at the surface within the IRW penetrates deeply into all of the geologic formations within the IRW. This deep fracturing is significant, because its presence means that the constituents from land application of poultry waste can not only easily move into shallow aquifers along dissolution-expanded (karsted) infiltration routes, it can also penetrate to greater depths along the deep seated fractures and faults, and thus threaten deeper aquifers. The terrain of the bulk of the IRW is mantled karst. In mantled karst terrains the dissolution of carbonate units beneath a covering of soil and regolith creates expanded infiltration pathways including, sinkholes, solution expanded fractures, faults and caves. The fracturing and faulting within the IRW, combined with karstification (which enlarges subsurface faults and fractures) produces areas of high permeability, and results in a circumstance in which shallow ground water aquifers are particularly susceptible to impact by surface contamination, including contamination by bacteria, that can readily travel from the soil surface to surface water and ground water during rainfall events. Within such a karst terrain, there is little attenuation (reduction) of contaminants as they move from the land surface into and through the karst aquifer. Thus, land application of poultry waste to the karst terrain of the IRW means that constituents of this waste (including bacteria) travel readily through the soils and underlying geologic media to discharge at and into ground water springs and surface streams throughout the IRW. Further, because of the ready flow of water through a karst terrain of the type present in the IRW, there is strong interaction between surface water flow and ground water flow so that surface waters readily become ground water and ground water readily becomes surface water. The phenomenon is readily shown by the numerous springs and gaining and losing streams found within the IRW.

(c) Soils within the Illinois River Watershed are formed mostly from the weathering of carbonate rocks, and are of low natural fertility. The soils are typically loams and are often rocky due to the presence of chert fragments. Loam soils are mixtures of sand, silt, clay and organic matter. Depending on the relative proportion of sand, silt and clay, these soils will be susceptible to infiltration or surface runoff. Soils susceptible to run off dominate in the eastern and western portions of the IRW. Soils that are susceptible to infiltration dominate in the central portion of the IRW. Thus, contaminants deposited on the surface within the IRW are prone to runoff from soils in about half of the watershed and are prone to infiltration through soils in the remaining half of the watershed.

(d) The geology and terrain of the IRW allows the constituents of land applied poultry waste (including bacteria) to readily travel from the fields receiving poultry waste into surface and ground water. This fate and transport of the contaminants of land applied poultry waste has been verified by scientific literature on this subject and by analyses of environmental media taken within the IRW. Thus, bacteria present in land disposed poultry waste are transported to surface waters (by runoff during rainfall events) and also infiltrate into ground water within the IRW.

8. There are 3563 ground water wells in the IRW including 1717 wells in the Oklahoma portion of the IRW that are documented by the Oklahoma Water Resources Board. Of the 1717 wells in Oklahoma, 1679, or 98% are registered for "Domestic" use (for drinking and other household purposes). Based on my experience and observations these domestic wells do not employ treatment systems that would eliminate any bacterial hazard. Given the above analysis of the geology and terrain of the IRW, surface water contaminated with land applied poultry waste will readily travel to shallow, and often deep, ground water aquifers.

9. Bacteria and other particulate constituents of land applied poultry waste, as well as soluble constituents of land applied poultry waste, are transported by water from the surfaces of fields where the poultry waste is applied to both surface water and ground water within the IRW. Eventually these poultry waste constituents are transported by the flow of water within the IRW to Lake Tenkiller, a man-made reservoir formed by the damming of the Illinois River by the U. S. Army Corps of Engineers beginning in about 1947 and in full operation by about 1953. If land application of poultry waste continues in the IRW it will continue to cause bacterial and other particulate constituents and soluble constituents from poultry waste to be transported to the surface and ground waters of the IRW.

10. Based on scientific literature, acoustic measurements, analyses of samples, and direct observation, a portion of the sediments and other solids transported by the Illinois River and the other major streams of the IRW to Lake

Tenkiller settle through the water column and accumulate as sediments covering the bottom of Lake Tenkiller. In addition, a portion of the dissolved constituents transported by the Illinois River to Lake Tenkiller are made into solids by biological, biochemical and/or chemical processes, and a portion of these solids also settle through the Lake's water column and accumulate as sediments covering the bottom of Lake Tenkiller. The physical, chemical and biological nature of sediments settling to the bottom of Lake Tenkiller reflect historical conditions and activities concerning land use and land cover within the IRW and the physical, chemical and biological nature of Lake Tenkiller. Thus, the sediments accumulating within Lake Tenkiller reflect the effects of the historical land disposal of poultry waste within the IRW.

11. Based on analyses of undisturbed sediment cores collected from Lake Tenkiller, the sediment concentrations of phosphorus and other contaminants from poultry waste have increased over time within sediments accruing within Lake Tenkiller. The temporal pattern of increased concentrations of phosphorus and other contaminants from poultry waste observed for these undisturbed sediment cores collected from Lake Tenkiller are directly related to the changes (growth) in poultry production within the IRW and do not relate to the pattern of cattle production or human population within the IRW. In other words, increased production of poultry within the IRW over time has caused an increase of poultry contaminants in Lake Tenkiller over time. This indicates a direct relationship between poultry production and water contamination in the IRW and contamination

of the sediments of Lake Tenkiller. On the other hand, no such relationship exists with cattle production or human population in the IRW. Furthermore, this analysis shows that the karst geology and soils of the IRW allow for ready transport of the constituents of land applied poultry waste into the surface water and ground water of the IRW which eventually travel to the water and sediments of Lake Tenkiller.

FURTHER AFFIANT SAYETH NOT.

J. Berton Fisher, Ph. D.

Subscribed and sworn to me by J. Berton Fisher, Ph.D., on the 12th day of November, 2007.

Signature Betty de Jong

Printed Name Betty de Jong

BETTY DEJONG
NOTARY PUBLIC
NO. 99013695
EXPIRES 8-17-11
STATE OF OKLAHOMA
TULSA COUNTY

Notary Public, State of Oklahoma, County of Tulsa

My Commission Expires; 8-17-11